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Research Article

Effects of a Supplemental Spanish Phonological Awareness Intervention on Latinx Preschoolers' Dual Language Emergent Literacy Skills

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Purpose: Preschoolers' phonological awareness (PA) and alphabet knowledge (AK) skills are two of the strongest predictors of future reading. Despite evidence that providing at-risk preschoolers with timely emergent literacy interventions can prevent academic difficulties, there is a scarcity of research focusing on Latinx preschoolers who are dual language learners. Despite evidence of benefits of providing Latinxs with Spanish emergent literacy instruction, few studies include preschoolers. This study examined the effects of a supplemental Spanish PA and AK intervention on the dual emergent literacy skills of at-risk Latinx preschoolers.
Method: A multiple probe design across four units of instruction evaluated the effects of a Spanish supplemental emergent literacy intervention that explicitly facilitated generalizations to English. Four Latinx preschoolers with limited emergent literacy skills in Spanish and English participated in this study. Bilingual researchers delivered scripted lessons targeting PA and AK skills in individual or small groups for 12–17 weeks.
Results: Children made large gains as each PA skill was introduced into intervention and generalized the PA skills they learned from Spanish to English. They also improved their English initial sound identification skills, a phonemic awareness task, when instruction was delivered in Spanish but with English words. Children made small to moderate gains in their Spanish letter naming and letter–sound correspondence skills and in generalizing this knowledge to English.
Conclusion: These findings provide preliminary evidence Latinx preschoolers who are dual language learners benefit from emergent literacy instruction that promotes their bilingual and biliterate development.

The path to becoming a proficient reader starts in preschool (Byrne et al.,2000). Preschoolers' development of emergent literacy skills, particularly phonological awareness (PA) and alphabet knowledge (AK), set the foundation for future reading (Torgesen, 2002; Whitehurst & Lonigan, 1998). PA is the analysis and synthesis of spoken language into words, syllables, and phonemes (e.g., rhyming, segmenting, blending; Bailet et al., 2011). Children's mastery of PA skills facilitates their understanding of the relation between spoken words and written text. AK refers to knowledge of letter names and letter–sound correspondence. Children who do not readily learn AK and PA skills require explicit instruction to gain these important emergent literacy skills (Goldstein, 1990).

Almost half of Latinx preschoolers (*Latinx* is a gender neutral term of Latino or Latina used to describe individuals who are from Latin America) who are dual language learners (DLLs) enter kindergarten with reduced emergent literacy skills in Spanish and English (Fuller, 2011). Without early, effective supplemental intervention, these children may be at risk of persisting reading difficulty. Despite evidence that providing preschoolers with PA and AK instruction lowers their risk of reading difficulty (Ehri et al., 2001), research investigating the effects of

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providing PA and AK instruction to preschoolers who are Latinx DLLs is limited (Barnett et al.,2007; Durán et al., 2010; Farver et al., 2009). There is growing empirical evidence from experimental studies showing benefits of providing Latinx preschoolers who are DLLs with emergent literacy instruction in Spanish while supporting their acquisition of English language skills (Anthony et al., 2011; López & Greenfield, 2004). However, the bulk of research on emergent literacy interventions has only focused on English-speaking monolingual preschoolers (Ehri et al., 2001) or has only been delivered in English to Latinx preschoolers (Durán et al., 2016; Larson et al., 2020; Soto et al., 2019). This scarcity of research targeting effective approaches for meeting the cultural and linguistic needs of Latinx preschoolers when delivering emergent literacy interventions leaves educators and clinicians ill equipped to meet the needs of this population.

Emergent Literacy Interventions for Preschoolers Who Are DLLs

To date, only five studies have specifically investigated the effects of providing Latinx preschoolers who are DLLs with emergent literacy interventions (Barnett et al., 2007; Durán et al., 2010; Farver et al., 2009; Han et al., 2014; Roberts & Neal, 2004). Four of these five studies examined the effects of Latinx preschoolers' PA gains when instruction was embedded within a larger curriculum targeting an array of skills such as High Scope (Barnett et al., 2007; Farver et al., 2009) or Creative Curriculum (Durán et al., 2010; Han et al., 2014). The High Scope curriculum targets rhyming, syllable awareness, AK, and dialogic reading, whereas Creative Curriculum targets rhyming, alliteration, AK, print awareness, and oral language. Children receiving PA instruction using High Scope made moderate (Barnett et al., 2007) to large gains (Farver et al., 2009), while children receiving PA instruction through Creative Curriculum did not make any PA gains (Durán et al., 2010; Han et al., 2014).

Only one study has examined the effects of providing Latinx preschoolers with an intervention focusing specifically on PA and AK instruction (Roberts & Neal, 2004). Roberts and Neal targeted letter knowledge and rhyming. Although the children in this study improved their letter–sound correspondence, they did not improve their rhyming skills. A limitation of this approach may be that children are not provided with evidence-based strategies for promoting emergent literacy, including explicit instruction, contingent feedback, and multiple practice opportunities (Goldstein, 2011; Pollard-Durodola & Simmons, 2009). Thus, research is needed to investigate the effects of providing Latinx preschoolers who are DLLs with emergent literacy instruction that is focused, explicit, and systematic.

We also need to consider other potential shortcomings evident in existing interventions that have been applied to Latinx preschoolers who are DLLs. First, most of the existing interventions are direct translations from English to Spanish. Second, few studies consider cross-language transfer in emergent DLL's dual literacy skills. Third, there is little research that evaluates children's performance when emergent literacy instruction is delivered in Spanish. Finally, children's outcomes are typically only assessed in one language.

Direct Translations

A major limitation in existing emergent literacy interventions for Latinx preschoolers who are DLLs is that most curricula are direct translations from English (Soto et al., 2019). Although Spanish and English are both alphabetic languages, they have distinct linguistic features that influence emergent literacy acquisition (Anthony, 2011; Gorman & Gillam, 2003; Jimenez et al., 2000). For example, in Spanish, most words are multisyllabic, consonant–vowel–consonant–vowel (CVCV) word structures; there are only five vowel sounds; and there are no consonant clusters in the final positions of words. In English, most words are monosyllabic, CVC words structures are most common, there are 14 distinct vowel sounds, and consonant clusters appear in the final position. These linguistic differences influence the ease of PA tasks (Pollard-Durodola & Simmons, 2009). Whereas phoneme-level awareness is most predictive of future reading in English, syllable-level awareness is more predictive of reading in Spanish (Ehri et al., 2001). In English, compound words are easiest to manipulate, followed by words, syllables, and phonemes. Preliminary evidence indicates that compound words are more difficult to manipulate in Spanish and that two-syllable words are the easiest to manipulate (Anthony et al., 2011).

Directly translating curricula without considering the linguistic differences between Spanish and English can reduce the validity of curricula (Peña et al., 2016). For example, many existing curricula have expressive phoneme manipulation of CVC words in Spanish (Farver et al., 2009; Linan-Thompson et al., 2005; Vaughn, Linan-Thompson, et al., 2006). This expressive task is not as appropriate in Spanish because syllable awareness is more salient for reading in Spanish and there are few words in Spanish with final consonants, and because Spanish readers do not segment words at the phonemic level when reading. Thus, providing PA instruction to Latinx children who are DLLs requires consideration of the language differences between Spanish and English.

Cross-Language Transfer of Emergent Literacy Skills

Another limitation is the lack of consensus regarding the cross-language transfer of emergent literacy skills. Cross-language transfer refers to the extent to which knowledge in one language generalizes to the other language (Durgunoglu et al., 1993; Verhoeven, 2007). According to the Revised Interdependence Linguistic Hypothesis (Verhoeven, 2007), children with strong PA skills in one language will generalize these skills to their other language. There is research indicating that Latinx DLL children with high PA skills in Spanish will also exhibit high PA skills in English (Dickinson et al., 2004; López & Greenfield, 2004), but other research

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has been contradictory (Petersen & Gillam, 2013; Scarpino et al., 2011).

Gottardo et al. (2011) posit that contradictory findings regarding the cross-language transfer of emergent literacy skills among individuals who are DLLs relates to limitations in assessment and failure to consider the extent to which child-level, home-level, and classroom-level factors might influence transfer. Pollard-Durodolla and Simmons (2009) suggest that children with reduced emergent literacy skills in both languages will have difficulty generalizing skills from one language to the other without direct instruction.

Our existing understanding of cross-language transfer of emergent literacy skills in children who are DLLs is based on correlational studies (Cardenas-Hagan et al., 2007; Petersen & Gillam, 2013; Scarpino et al., 2011). To date, no study has empirically examined the effects of providing children who are DLLs with explicit instruction that facilitates their generalization of emergent literacy skills from one language to the other. The limited number of empirical studies evaluating the extent of cross-language transfer of emergent literacy skills could be contributing to the contradictory findings in the literature.

Language of Instruction

Latinx preschoolers entering kindergarten with limited English language skills may have more difficulty acquiring emergent literacy skills when instruction is delivered only in English (Pollard-Durodola & Simmons, 2009). Yet, most of the current PA and AK interventions for Latinx children who are DLLs are in English (Calhoon et al., 2007; Linan-Thompson et al., 2003; Roberts & Neal, 2004). The results of these studies indicate that Latinx children make gains in English PA following instruction, but some children continue struggling to catch up to their English-speaking monolingual peers (Calhoon et al., 2007). There is growing evidence that DLL children receiving PA and AK instruction in Spanish and English make greater gains in both languages without sacrificing their English acquisition (Durán et al., 2010; Vaughn, Cirino, et al., 2006). Although the results of studies delivering Spanish emergent literacy interventions with children in early elementary school are promising (Linan-Thompson et al., 2005; Soto et al., 2019; Vaughn, Linan-Thompson, et al., 2006), such studies have yet to be conducted with Latinx preschoolers.

PAth to Literacy

PAth to Literacy (Goldstein, 2016), a brief, supplemental PA intervention targeting English-speaking monolingual preschoolers at risk for academic difficulty (Kruse et al., 2015; Olszewski et al., 2017; Spencer et al., 2015), was adapted for this study. Goldstein et al. (2017) found that *PAth to Literacy* led to significant gains on English-speaking monolingual preschoolers' AK and PA skills. Eighty-two percent of English-speaking monolingual preschoolers with delayed PA development receiving this *PAth to Literacy* met the benchmark for the beginning of kindergarten on the first sound fluency measure of the Dynamic Indicators of Balanced Early Literacy Scale (DIBELS; Dynamic Assessment Group, 2006).

PAth to Literacy was chosen as the intervention to be adapted for Spanish-speaking DLLs because it incorporates instructional approaches that have been shown to be effective with struggling learners. These instructional approaches include a systematic scope and sequence, explicit instruction, and contingent feedback (Goldstein & Olszewski, 2015). This intervention also combines PA and AK instruction. Combining PA and AK instruction has been shown effective in teaching children who are falling behind their peers (Ehri et al., 2001). While there are other emergent literacy interventions available for Latinx preschoolers (e.g., Barnett et al., 2007; Farver et al., 2009), most other interventions embed PA instruction within the scope of many other skills, including comprehension and vocabulary. These interventions are beneficial for children receiving general classroom instruction. However, *PAth to Literacy* is designed specifically for struggling learners who are not responding to general classroom instruction and who might benefit from a multitiered system of supports (Carta & Miller-Young, 2019). To date, research that has focused on developing and evaluating focused, supplemental emergent literacy interventions for Spanish-speaking preschoolers who are DLLs is scant (Soto et al., 2019).

Adapting *PAth to Literacy* for preschoolers who are DLLs has significant advantages. First, this curriculum has already been shown to be effective for children who are English-speaking monolingual. Second, it incorporates progress monitoring that facilitates decision making and tailored instruction. Third, its frequent progress monitoring reduces test bias and decreases the likelihood of a misdiagnosis in linguistically diverse populations (Patterson et al., 2013; Tzuriel, 2001). Finally, its Spanish adaptation can provide instruction in children's home language while generalization to English.

Purpose

Although there is strong evidence in favor of providing preschoolers at risk for literacy difficulties with early, evidence-based emergent literacy instruction targeting PA and AK, there is little research focusing on Latinx preschoolers who are DLLs. Most existing studies are in English or direct translations from English to Spanish, which reduces their validity. There is promising, preliminary evidence suggesting that Latinx children benefit from instruction in Spanish and that they can generalize the skills they learn in Spanish to English. However, there is limited research evaluating the effects of providing Latinx preschoolers who are DLLs with Spanish emergent literacy instruction that explicitly facilitates their generalization of skills from one language to the other. The purpose of this study is to evaluate the effects of a Spanish adaptation of *PAth to Literacy* on the dual language emergent literacy skills of at-risk Latinx preschoolers. The following research questions are addressed:

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1. To what extent do children improve and generalize the PA skills they learn in one language to the other language?
2. To what extent do children improve and generalize the letter naming and letter–sound correspondence skills they learn in one language to the other language after receiving AK instruction through instructive feedback?

Method

Participants

Participants were Latinx DLLs ages 4–5 years old. Participants were recruited from two classrooms in a privately owned preschool in the western region of Florida that received state funding for families who have low income. Ninety-eight percent of the children who attended these preschool classrooms were Latinxs who were DLLs. The two teachers in the classrooms were Latinx, Spanish–English bilingual speakers who delivered the majority of the classroom instruction in English using Creative Curriculum (Dodge et al., 2015). Spanish was used for social interactions and to clarify instructions. The study took place during the spring semester of children's prekindergarten year, so children had at least one semester of exposure to general classroom instruction.

Following approved institutional review board procedures, teachers helped identify the children in the classroom who were fluent Spanish speakers. Parent consent forms were sent home in Spanish and English. All children with parental consent were screened using English and Spanish versions of researcher-developed curriculum-based measures (CBMs) of PA and AK.

Participant Criteria

For children to be included in the study, they needed to (a) have adequate Spanish language skills to benefit from the Spanish PA curriculum as indicated by a standard score of 85 or higher on the Bilingual English–Spanish Assessment (BESA; Peña et al., 2014) and a score of 8 or more on the Spanish/English Narrative Language Measures (NLM; Peter & Spencer, 2012), (b) speak and hear Spanish at home at least 50% of the time as indicated by their scores on the Bilingual Input–Output Survey (Peña et al., 2014), (c) have no history of developmental delay or hearing loss per parent and teacher reports, and (d) demonstrate low PA and AK skills in Spanish and English prior to the intervention as indicated by their score of 5 or less on the Spanish/English PA and AK CBMs.

Participant Selection

The goal of participant selection was to identify Latinx DLL preschoolers who spoke Spanish and who demonstrated low Spanish and English emergent literacy skills prior to the intervention. Twenty-four children were screened. From these 24 children, five met the inclusion criteria. One participant withdrew from the school, leaving four participants. Their descriptive information is presented in Table 1. All the participants were girls, with an average age of 5;1 (years;months; range: 4;10–5;6). All of the participants were exposed to more Spanish than English at home (range of 67%–87% Spanish exposure). They all had language skills that were above average in Spanish and English, as indicated by their scores on the standardized bilingual language assessment, the BESA. Three of the four participants met the benchmark of 8 on the Spanish and English NLMs, indicating they had adequate oral language skills in both languages. However, one child (Adelia) did not retell the stories on the NLMs. The first author used her clinical judgment to conclude that her performance on the NLMs were not reflective of her oral language skills. Because she received above average language scores on the standardized language measure and participated actively as she became familiar with the research staff, she was included in the study. Participants with high language skills were included in this study, because they were considered at risk for reading difficulty solely based on their low performance on bilingual measures of early literacy.

Data gathered from a family demographic questionnaire indicated that two of the four participants came from families in which parent(s) had received a high school diploma, one came from a family in which the parent(s) had received some high school education, and one participant came from a family in which one of her parents completed a bachelor's degree. Three of the four participants resided in homes with an average family income ranging from $16,000 to $18, 999. One participant came from a family in which the average family income was $25,000–$27,999. Three of the participants were of Cuban descent, and one of the participants came from Mexican descent. They all lived in a community with a predominantly Latinx population.

Measures

Descriptive language measures were used to identify the children who spoke Spanish and could benefit from Spanish instruction, and family and teacher demographic information was used to describe the participants. Proximal and generalization measures were administered in Spanish and English to measure children's PA and AK skills. Social validity measures were used to evaluate teachers' and children's perceptions of the intervention.

Descriptive Measures

The BESA (Peña et al., 2014) was used as a descriptive measure of children's Spanish and English language skills and to identify which children spoke and understood enough Spanish to benefit from the intervention. The BESA is a standardized assessment normed on children who were bilingual. The Morphosyntax, Semantics, and Phonology subtests of the BESA were administered in both Spanish and English. The BESA takes approximately 30 min to administer in each language. The BESA yields a mean score of 100, with a standard deviation of ± 15, with a range

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Table 1. Description of participants.

Child	Age (at pretest)	Gender	Heritage	BESA results		BIOS results		Spanish NLM	English NLM
				Language index score	Best language	%SIO	%EIO		
Cynthia	4;10	F	Cuban	142	Spanish	67%	33%	15	10
Ana	5;1	F	Cuban	138	Spanish	87%	13%	8	11
Denise	5;5	F	Mexican	145	Both	68%	32%	16	8
Adelia	5;6	F	Cuban	140	English	70%	30%	0	0

Note. BESA = Bilingual English–Spanish Assessment (M = 100, SD = 15); BIOS = Bilingual Input–Output Survey; NLM = Narrative Language Measures (benchmark: 8); %SIO = Spanish Input–Output; %EIO = English Input–Output; F = female.

between 55 and 145. For each subtest, it is determined whether children receive their highest standard score in Spanish or English. Children's best standard scores on the Semantic and Morphosyntax subtests are then used to determine a composite Language Index score. This Language Index score is a weighted average of the children's standard scores on the Semantics and Morphosyntax subtests.

The Bilingual Input–Output Survey from the BESA was used to assess children's language exposure history and to determine how much Spanish they heard at home. Survey questions pertain to the languages children hear each hour during a typical school day and during a typical weekend. This survey is completed by parents or caregivers, presented in English or Spanish, and it takes 10–15 min to complete.

The Spanish and English versions of the Test of Narrative Retell from the Narrative Language Measure: Preschool (Petersen & Spencer, 2012) were used to supplement the results obtained from the BESA. The Spanish and English Test of Narrative Retell contains three age-appropriate, brief, parallel stories with familiar themes and a consistent story grammar. The administrator reads each story and asks the child to retell the story. Children's retellings are evaluated to determine if they contain story features, including character, setting, problem, emotion, attempt, consequence, and an ending. Children can obtain a total of up to 24 points per retelling. The best score from the three retellings produced is counted. The benchmark for children in preschool on the NLM is a score of 8. The Narrative Language Measure: Preschool's alternate form reliability is considered adequate (.77).

A family demographic questionnaire was used to gather information regarding the participants. This questionnaire inquired about parents' income, parents' highest level of education, the specific language(s) spoken at home, children's home literacy and language experiences, and parents' perceived role in children's emergent literacy development. This questionnaire was available in English and Spanish.

A teacher questionnaire was used to gather information about teacher and classroom characteristics. This questionnaire asked about the number of years teachers taught, teachers' highest level of education, the curriculum used in the classroom, the number of children who are DLLs in the classroom, the language(s) of instruction in the classroom, and current practices employed for children who were demonstrating academic delays.

Proximal Measures of PA and AK

At the end of each lesson, a Mastery Monitoring probe was administered to assess children's learning of the PA and AK skills targeted during instruction. This assessment was administered in small groups or individually, depending on the composition of the session. Each child had the opportunity to respond to three stimuli related to the PA task targeted during instruction. Two of the stimuli were ones reviewed during the lesson, and one was a novel stimuli beginning with a different sound than the ones targeted during instruction. Each child could earn up to 3 points on the probe. Children's knowledge of the four letters targeted using instructive feedback were also evaluated at the end of each lesson. Each child was presented with an array of the four letters targeted during instruction. They were instructed to identify the letter named and to identify its sound. Children earned 1 point per each letter and 1 point per sound identified correctly.

A Spanish adaptation of the English PA CBM used in previous studies of *PAth to Literacy* (Olszewski et al., 2017) served as a proximal measure of Spanish PA skills. The English PA CBM was used to measure generalization of taught Spanish PA skills to English. The Spanish PA CBM contained three subtests: Blending, Segmenting, and First-Part Identification. These measures were parallel in Spanish and English. Initial sound identification only was assessed in English, as this task is appropriate for English, but not Spanish. For each subtest, the PA skill was introduced and modeled. Each subtest had a total of 10 points. Children received 1 point per correct response and 0 for incorrect responses. The animal characters used during instruction for each unit were present during the assessments to help children discriminate between PA tasks. All instructions were provided in Spanish. Following the instructions, children were asked to complete the targeted PA task for 10 words. Three parallel versions of the PA CBM were created in each language. The instructions remained the same, but the stimuli were changed.

The AK CBMs in Spanish and English (Olszewski et al., 2017) served as a proximal measure of alphabetic knowledge in Spanish and English. These measures assessed children's knowledge of the 16 target alphabet letters and

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their corresponding sounds. Instructions were provided in the language of the assessment. For each assessment, children were shown a card containing a target letter. They were asked to name the letter and its corresponding sound. Children earned 1 point for naming the letter and an additional point for naming its sound correctly, having a possible total of score of 32 (16 letter names and 16 sounds). Although children's knowledge of all 16 letters was assessed during each administration, scores were calculated for each letter set corresponding to the units of instruction.

The order of presentation of Spanish and English measures was counterbalanced across children. Interventionists only spoke to the children in the language of the assessment to reduce code switching. A gamelike format (e.g., fishing, feeding a monster) was used when completing these measures. The measures took approximately 5 min to complete in each language.

Generalization Measures of PA and AK

Generalization measures of Spanish and English PA and AK were administered before and after the intervention. The First Sounds/*Primeros Sonidos* task from the Individual Growth and Development Indicators–Spanish (IGDIs-S; Wackerle-Hollman et al., 2012) served as the generalization measure of Spanish PA skills. The First Sounds task evaluated children's knowledge of the initial phoneme in words. In this task, the administrator named each object on a card and then provided the beginning sound of one of those words. Children were asked to identify the picture that corresponded to that initial sound (for a possibility of 8 points per task). This measure was selected as an outcome measure of Spanish PA because, although expressive initial sound identification tasks of CVC words do not reflect Spanish reading, this receptive task was appropriate for this language.

The Phoneme Segmentation Fluency (PSF) and Initial Sound Fluency (ISF) tasks from the DIBELS (Dynamic Assessment Group, 2006) served as the generalization measures of English PA skills. The PSF subtest evaluates children's ability to segment one-, two-, and three-syllable words into individual phonemes in a 1-min fluency task. Evaluators orally presented the target words, and children are instructed to segment as many words as they can in 1 min. Although this measure was normed on children in kindergarten and the early elementary years, it has been used successfully in previous studies with preschoolers (Goldstein et al., 2017; Olszewski et al., 2017). The alternate form reliability for this measure is adequate (.82).

The DIBELS ISF measure evaluates children's ability to hear and produce initial sounds in words. This is a 1-min fluency task in which children are orally presented with up to 30 words, and they are instructed to isolate the initial sound of the word. For each word, a score of 3 indicates children isolated the initial sound in the word, a score of 2 represents the child isolated the first syllable or blend in a word, and 0 points indicate an incorrect response. This measure has a high alternate form reliability of .88.

The Letter Naming and Sound Identification subtests from the IGDIs in Spanish (Wackerle-Hollman et al., 2012) and English (McConnell et al., 2012) were administered. These subtests served as generalization measures of alphabetic knowledge. Each subtest is 15 items. The Letter Naming subtest evaluates children's knowledge of alphabet letters. Children are presented with individual uppercase letters and instructed to name them. Letters are presented individually and in a field of three. The Sound Identification subtest measures children's knowledge of phonemes. Children are presented with a field of three uppercase letters and asked to identify the target phoneme out of a field of three.

Social Validity Measures

At the end of the study, teachers and children were asked to complete social validity questionnaires about *PAsos Para Leer*. Evaluating social validity is particularly beneficial when initially developing and evaluating the effects of interventions as social validity results can inform future iterations of interventions to optimize users' likelihood of buy-in and acceptability (Soto et al., 2019). The teacher survey contained questions about the feasibility of the intervention in classroom use, the perceived effectiveness of the intervention, the likelihood of future use, and their perception regarding the provision of instruction in Spanish and English.

Children's perception of the social validity of *PAsos Para Leer* was also evaluated. Children were asked simple questions to determine whether they enjoyed the intervention and whether they liked working with the interventionists. Interventionists presented the questions to the children orally while presenting them with a visual Likert scale to help them rate whether they liked (happy face), were indifferent (neutral face), or disliked (disapproving face) a particular component of the intervention.

Intervention

PAsos Para Leer

PAsos Para Leer, adapted from *PAth to Literacy* (Goldstein, 2016), is a supplemental intervention that targets PA and AK and explicitly prompts generalization of these emergent literacy skills from one language to another. *PAsos Para Leer* is composed of four units targeting the emergent literacy PA skills, *mezclar* (blending), *separación* (segmenting), *identificación de la primera silaba* (initial word-part identification), and *identificación de el sonido inicial* (initial phoneme identification), and four letters per unit (see Table 2). Units 1–3 contained Spanish instruction with Spanish stimuli followed by English stimuli to facilitate transfer of the PA skills taught in Spanish to English. Because Unit 4 targets initial sound identification, a PA skill that is not as relevant to Spanish PA acquisition, this lesson consisted of Spanish instruction with English stimuli only.

Stimuli. Each unit targeted four letters (total 16) shared in Spanish and English and 18 target words carefully selected to be age appropriate and to exclude words with dialectical variations. Twelve of the words were in Spanish, and six of

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Table 2. Scope and sequence of *PAsos Para Leer*.

Intervention component	Unit 1	Unit 2	Unit 3	Unit 4
Letters	Ss, I, Pp, F	D, Kk, M, A	R, G, N, E	L, B, Cc, Ww
PA skill	Blending	Segmenting	First-part identification	First-sound identification
Word structure	2, 3 syllables	2, 3 syllables	2, 3 syllables	Compound words, 1 syllable

Note. PA = phonological awareness.

the words were in English. The English words selected for the intervention were extracted from a pool of words in *PAths to Literacy,* the existing English intervention program after which *PAsos Para Leer* is modeled (Olszewski et al., 2017).

Lessons. Each of the four units contained three parallel lessons with the same instruction but different stimuli. Each lesson progressed from less complex word structures to more complex word structures. For each lesson, direct instruction was used to teach children PA skills. At the beginning of each lesson, this explicit instruction was initially combined with high levels of support (e.g., manipulatives, visuals, and gestures) to scaffold children's learning. As the lesson progressed, the level of prompting was faded to promote children's independent responses.

Children had several response opportunities for guided and independent practice. Children were presented with feedback for correct, incorrect, and nonresponses. Children were encouraged to respond chorally with their small groups. Feedback was contingent upon group responses. If one child answered incorrectly, additional instruction was provided to them, so the child had another response opportunity before proceeding to the next trial.

AK was taught using instructive feedback. Instructive feedback is a procedure in which additional instruction is given after providing positive feedback during direct instruction (Olszewski et al., 2017; Werts et al.,1995). Following each positive feedback, interventionists followed scripted instruction to model the letter and sound that corresponded to the target word. Positive feedback was specific by restating why the child's answer was correct (e.g., "*!Muy bien! Las partes pequeñas de la palabra bola son bo-la!*" [Very good! The small parts of the word ball are b-all!]). An example of the instructive feedback delivered after the positive feedback is, "*Bola comienza con la letra (pausa) B. La letra B hace el sonido (pausa) /b/*" [Ball starts with the letter (pause) B. B makes the sound (pause) /b/]. As children progressed through the lesson, the time delay was increased from 1 to 3 s to facilitate their independent responses. Interventionists identified the target letter from a field of four letters to help children discriminate between the letters targeted during the unit. Each unit contained stimuli starting with one of the four letter targets to ensure children had multiple opportunities to practice the letters and sounds taught.

PAsos Para Leer specifically targeted cross-language generalization of emergent literacy skills. The first three units contained Spanish instruction with English stimuli at the end of each lesson to facilitate generalization, while the last unit contained only English stimuli with Spanish instruction. The Spanish meaning of the English words was provided to promote children's English vocabulary. Instruction applied a bilingual approach to highlight similarities across languages (e.g., "*También podemos separar palabras en ingles.*" [We can also segment words in English]. "*Vamos a separar la palabra bebé en ingles, baby*." [Let's separate the word 'bebé' in English, baby].

Trained bilingual researchers who were native Spanish speakers delivered instruction to individual or small groups of two children. Instruction took place 4–5 times per week. Each lesson was 10 min, and the intervention lasted for 12–17 weeks. Children's attendance during intervention ranged from 56% to 100%. Children's Spanish and English PA and AK skills were assessed at the end of each lesson using Mastery Monitoring probes. Each child was asked three questions on this measure and given 1 point per correct response. All of the children's scores were calculated to receive a group score. To progress through units, each child needed a score of at least 2 of 3 on the probe for the second lesson (Lesson B), and a total group score of 7 out of 9 to proceed to the next unit. If this criterion was achieved, Lesson C was skipped, and children progressed to the next unit. If this criterion was not met, they continued with Lesson C until they reached the criterion or until they had rotated through the three parallel lessons of the unit 3 times. If children did not meet the criterion after rotating through the three lessons of a unit, they progressed to the subsequent unit.

Procedure

Spanish–English bilingual undergraduate and graduate students delivered the interventions. To ensure that these researchers could effectively deliver the interventions in Spanish, their proficiency was assessed informally. Their Spanish literacy was evaluated by having them read a sample of the scripted PA lessons. The first author, who is a Spanish–English bilingual speech-language pathologist, engaged them in unstructured Spanish conversation to gauge their language proficiency. The first author taught these interventionists to administer the emergent literacy curriculum. The training included reviewing instruction materials and practicing delivering interventions. Interventionists received a manual with detailed instructions on completing the instruction. The interventionists delivered

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instruction with at least 80% fidelity before they provided the lessons.

PAsos Para Leer

Children's Spanish and English PA and AK were assessed at least 3 times using the Spanish and English PA and AK CBMs before initiating the intervention to ensure their gains were a result of *PAsos Para Leer*. Children receiving a score of 8 or less out of 40 on the Spanish and English PA CBMs and a score of 8 or less on the Spanish and English AK CBMs were selected for participation. Children with a higher score for the blending subtest of the PA CBM were included in the study if they demonstrated low segmenting, first part, and initial sound identification skills, as well as reduced AK.

Once the initial battery of assessments was administered, interventionists initially delivered the lessons in small groups of two children. However, because Cynthia went to Cuba for 2 weeks and one child withdrew from the study, sessions were later delivered individually to accommodate each child's progress. Instruction was given 4–5 days a week. The duration of each lesson was 10 min.

After treatment, children's Spanish and English PA skills were assessed 3 times within a 2-week period to evaluate their maintenance of skills. Children were assessed in one language per session to reduce testing fatigue. The order of the language in which children were assessed was counterbalanced across children.

Fidelity and Reliability

Administration fidelity was evaluated using a procedural observation checklist completed for 20% of the intervention sessions. Researchers scored fidelity on each other using the observation checklist. The checklist included procedures that were vital for lesson delivery, including reading the target items accurately, providing the appropriate feedback, reading the script verbatim, and maintaining children's positive behavior. Percentage of implementation fidelity was calculated by dividing the total number of observed procedural points by the total number of possible procedural points. The implementation fidelity for *PAsos Para Leer* in this study was an average of 98%, with a range of 94%–100%.

Twenty percent of the AK and PA CBMs administered were randomly selected and assessed for implementation fidelity and scoring fidelity. The administration of these assessments were audio-recorded and identified with a code so research assistants were blind to the children's identity and phase in the study. A trained research assistant listened to the audio recording and scored the implementation fidelity for the PA and AK CBMs. A percentage of fidelity were calculated by dividing the total observed number of procedures by the total number of possible procedures. The average implementation fidelity score for the Spanish PA CBM was 96% (range: 86%–100%), 95% for the English PA CBM (range: 93%–100%), and 98% for the AK CBM (range: 98%–100%).

Interrater reliability was determined by rescoring 20% of the assessments for the PA CBMs. The assessments rescored were randomly selected. A trained research assistant listened to audio recordings of the sessions and rescored the assessments. A percentage of item-level agreement was calculated to evaluate interrater reliability. The average interrater reliability scores for the Spanish PA CBM was 98.7% (range: 80%–100%). The average interrater reliability score for the English PA CBM was 98.5% (range: 80%–100%).

Experimental Design and Analysis

A multiple probe design across units of instruction was used to measure the effects of *PAsos Para Leer* on children's Spanish PA and AK skills. This design potentially allowed for four intersubject replications corresponding to the four participants and four within-subject replications corresponding to the units of instruction (Gast & Ledford, 2014). Baseline assessments were administered for each of the units for at least three sessions, for the first unit, and intermittently for the other units. Two or more assessments just prior to initiating treatment for the other units ensured the baseline performance remained low and stable. The length of the baseline and treatment phases was staggered across units of instruction.

Data Analyses

Visual analysis of graphical displays, effect size estimates, and pre- and posttest comparisons were used to determine the effects of *PAsos Para Leer*. The Spanish and English PA CBMs served as the primary outcome measures for the first research. The Spanish and English Letter Naming portion of the AK CBMs and the letter–sound correspondence portion of the Spanish and English AK CBMs served as the primary outcome measures for the second research question. Each participant's performance on the PA and AK CBMs was displayed graphically across baseline, treatment, and maintenance phases. Visual analyses evaluated whether a functional relationship existed between the treatment and the outcome measures (Gast & Ledford, 2014; Kratochwill et al., 2012). Within-phase and between-phases comparisons were completed. Within-phase comparisons included an analysis of the level, trend, and variability of the data. Between-phases comparisons analyzed the immediacy, overlap, and consistency of adjacent phases. Visual analyses also examined gains across the phases of instruction in each language.

To augment the visual analyses, effect size estimates were calculated using Tau-U (Parker et al., 2011). This is a method for calculating the effects of single-case experiments that accounts for nonoverlap between phases, accounting for trends in baseline and intervention phases. Tau-U scores are averaged to get a final effect size measure. Tau-U yields proportion scores ranging from 0 to 1.0. A score of .65 or lower is interpreted as a questionable effect, a score of .66–.92 is considered effective, and a score of .93 or higher is noted as very effective. Tau-U was calculated using

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a free, online tool, Single Case Research (http://www.singlecaseresearch.org/calculators).

Differences in children's performance on the generalization measures of Spanish and English PA at pre- and posttesting were compared. Children's scores on the IGDIs-S *Primeros Sonidos* (First Sounds) assessments before and after treatment were compared to evaluate PA gains. The ISF and First Sound Fluency subtests from the DIBELs served to determine if children generalized their Spanish PA skills to English. It was hypothesized that children would make gains in their Spanish PA skills and generalize them to English.

Children's performance on Spanish and English generalization measures of AK skills before and after the intervention was also compared to determine treatment effects. The Letter Naming and Sound Identification subtests of the IGDIs-S and its parallel English version were used to evaluate alphabetic knowledge. It was hypothesized that children would demonstrate significant gains in their Spanish and English letter naming and sound identification skills following the intervention.

Results

PA

Figure 1 depicts the results of children's Spanish and English PA gains for the first three units and children's English PA gains for the fourth unit (initial sound identification). The *y*-axis represents children's scores on the PA outcome measures, separated by unit of instruction, and the *x*-axis represents the days of intervention. The solid vertical line separates the baseline and the treatment phases. Children's Spanish and English scores are shown on each plot to compare their performance across their two languages. The open circles represent children's Spanish scores, and the black squares represent children's English scores.

Spanish and English PA Skills at Baseline

As shown in Figure 1, Denise, Adelia, and Ana showed elevated baselines for Spanish blending. Denise and Ana also demonstrated a high baseline for English blending. For segmenting, Ana and Cynthia showed a variable baseline in Spanish and English. Denise had a high point at baseline for English segmenting and first-part identification. The rest of the children showed a low and steady baseline in the first-part identification in Spanish and English and on Initial Sound Identification in English.

Spanish PA

As shown in Figure 1, children made gains in their Spanish PA skills following the intervention across all units of instruction. For blending, participants responded immediately to the intervention and maintained at high levels, except for two sessions for Cynthia. For segmenting, all four participants responded immediately to intervention and demonstrated highly accurate segmenting despite one or two low sessions for Cynthia, Adelia, and Denise. All children demonstrated immediate gains in first part identification and maintained their gains over time.

Overall, the results of the visual analyses that illustrate the effects of *PAsos Para Leer* on children's Spanish PA skills were replicated for 100% (12 of the 12) units across children. Impressive gains in PA were replicated for all the children. These results indicate a clear functional relation between *PAsos Para Leer* and children's Spanish PA skills.

Performance on Unit 4, English Initial Sound Identification

Unit 4 was unique in its delivery of Spanish instruction with English words. As can be seen in Figure 1, clear improvements were evident after many sessions of zero baseline once treatment was initiated. Cynthia's gains were minimal, Ana and Adelia showed moderate performance during treatment, and Denise fully mastered this PA skill.

Cross-Language Transfer of PA Skills

Visual inspection of the graphs revealed that all of the participants generalized the PA skills they learned from Spanish to English, and from English to Spanish for Unit 4. Their English performance mirrored their Spanish performance for Units 1 through 3. There was little overlap between their performances in the baseline and treatment conditions, indicating there is a functional relationship between their PA gains and the intervention.

Although children's initial sound skills were not evaluated in Spanish using the PA CBM, it should be noted that children generalized their English initial sound identification skills when asked to identify initial sounds in Spanish words receptively. This receptive Spanish task was chosen because identifying initial sounds in Spanish expressively is inadequate for the language. Three of the four children (with the exception of Cynthia) made gains on the Spanish *Primeros Sonidos* (Initial Sounds) task from the IGDIs, providing support that children generalized skills from English to Spanish as well.

Overall, children's cross-language transfer of Spanish to English PA was replicated for 12 of the 12 possible replications across participants. Three of the four children made gains in their Spanish initial sound identification skills after receiving English instruction on this task.

Effect Size Estimates of Spanish and English PA

Effect sizes were estimated using Tau-U to determine the magnitude of children's Spanish and English PA gains (see Table 3). Tau-U yields proportion scores ranging from 0 to 1.0. A score of .65 or lower is interpreted as a questionable effect, a score of .66–.92 is considered effective, and a score of .93 or higher is noted as very effective. The Tau-U score for the Spanish PA outcomes averaged .91 (range: .81–1.0), indicating that *PAsos Para Leer* was effective in improving children's Spanish PA skills. These effect size estimates corroborate the findings from the visual analyses, confirming that *PAsos Para Leer* improved children's Spanish PA skills. Effect size estimates indicated

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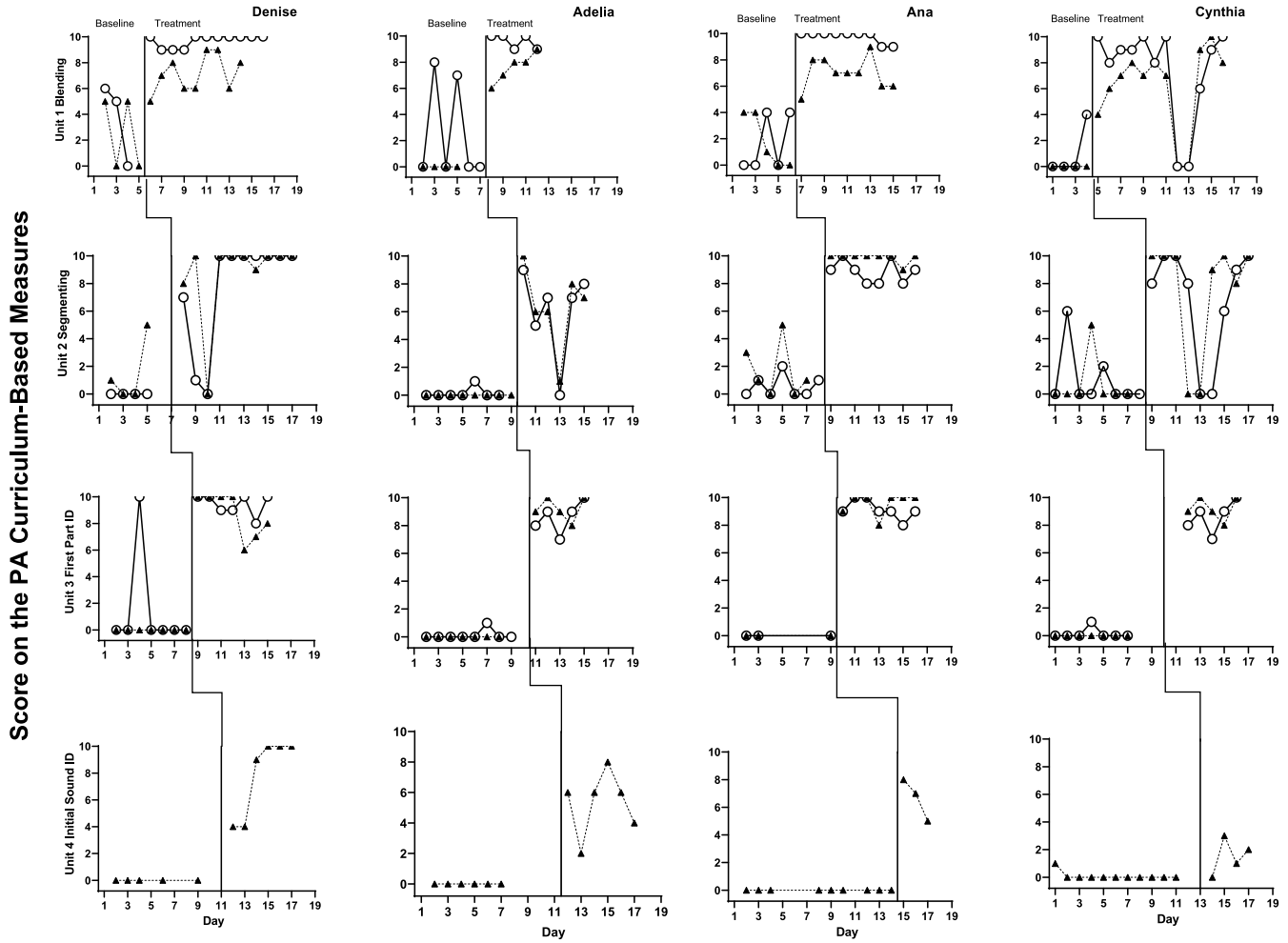
Figure 1. Participants' Spanish and English scores on the phonological awareness (PA) curriculum-based measures across units of instruction. Spanish is represented by open circles, and English is represented by the black triangles. Children were assessed across sessions.



that the average Tau-U score for English PA was .93 (range: .79–.99), indicating the intervention was very effective and that children generalized the skills they learned in Spanish to English and the ones they learned in English to Spanish.

Generalization Measures of PA Skills

The *Primeros Sonidos* subtest of the IGDIs-S served as the generalization measure of Spanish PA. Three of the four children (all except Cynthia) met the benchmark (a score of 8 or higher) on this subtest after receiving the intervention.

Table 3. Tau-U effect size estimates for Spanish and English primary outcomes.

	Phonological awareness		Alphabet knowledge			
Child	Spanish PA CBM	English PA CBM	Spanish letter names CBM	Spanish letter–sound correspondence CBM	English letter names CBM	English letter–sound correspondence CBM
Denise	.81	.98	.90	.52	.09	.46
Adelia	.94	.95	.73	.76	.17	.72
Cynthia	.90	.79	.10	.31	.15	.33
Ana	1.0	.99	.40	.73	.36	.62
Average	.91	.93	.53	.58	.19	.53

Note. Tau-U: ≤ .65 = questionable effects, .66–.92 = effective, ≥ .93 = very effective. PA = phonological awareness; CBM = curriculum-based measure.

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Cynthia only increased her score by 1 point. Denise showed the greatest gains on the *Primeros Sonidos* measure, 11 points. Ana and Adelia increased by 6 and 5 points, respectively.

The ISF and PSF tasks from the DIBELS served as the generalization measure of English PA. Denise exceeded the first sound fluency (FSF) benchmark (10+) with a score of 14. Although Ana and Adelia did not meet the benchmark, they were close to achieving it with a score of 9. Cynthia did not show gains on the FSF measure. Denise and Adelia exceeded the PSF benchmark of 20+. Ana was close to meeting this benchmark with a score of 18, and Cynthia increased her score to 14 points.

AK

The second research question was answered by analyzing children's Spanish and English AK letter naming (see Figure 2) and letter–sound correspondence gains (see Figure 3) on the Spanish and English AK CBMs. For each participant's graph, the *x*-axis represents the days of intervention. The *y*-axis represents children's knowledge of Spanish and English letter names (see Figure 2) and Spanish and English letter–sound correspondence (see Figure 3). The solid black lines separate children's performance during the baseline, treatment, and maintenance phases showing the staggered initiation of units of instruction. Children's Spanish performance is represented by white squares, and their English performance is represented by black triangles.

Spanish and English Letter Naming and Letter–Sound Correspondence at Baseline

As seen in Figure 2, all children had low letter-naming skills in Spanish before the intervention. In comparison to Spanish, all the children knew a number of letter names in English, especially Denise. In regard to letter–sound correspondence (see Figure 3), Denise had high baselines in Spanish and English for most of the units, reflecting ceiling effects for all units except for the fourth unit. Adelia had a low and steady baselines in Spanish and English prior to the intervention for Units 2, 3, and 4. Ana had a low baseline for all units in Spanish. Her baselines were variable in English, indicating she knew some English letter sounds prior to the

Figure 2. Participants' Spanish (white squares) and English (black triangles) letter-naming scores on the alphabet knowledge curriculum-based measure across units of instruction as measured across sessions.

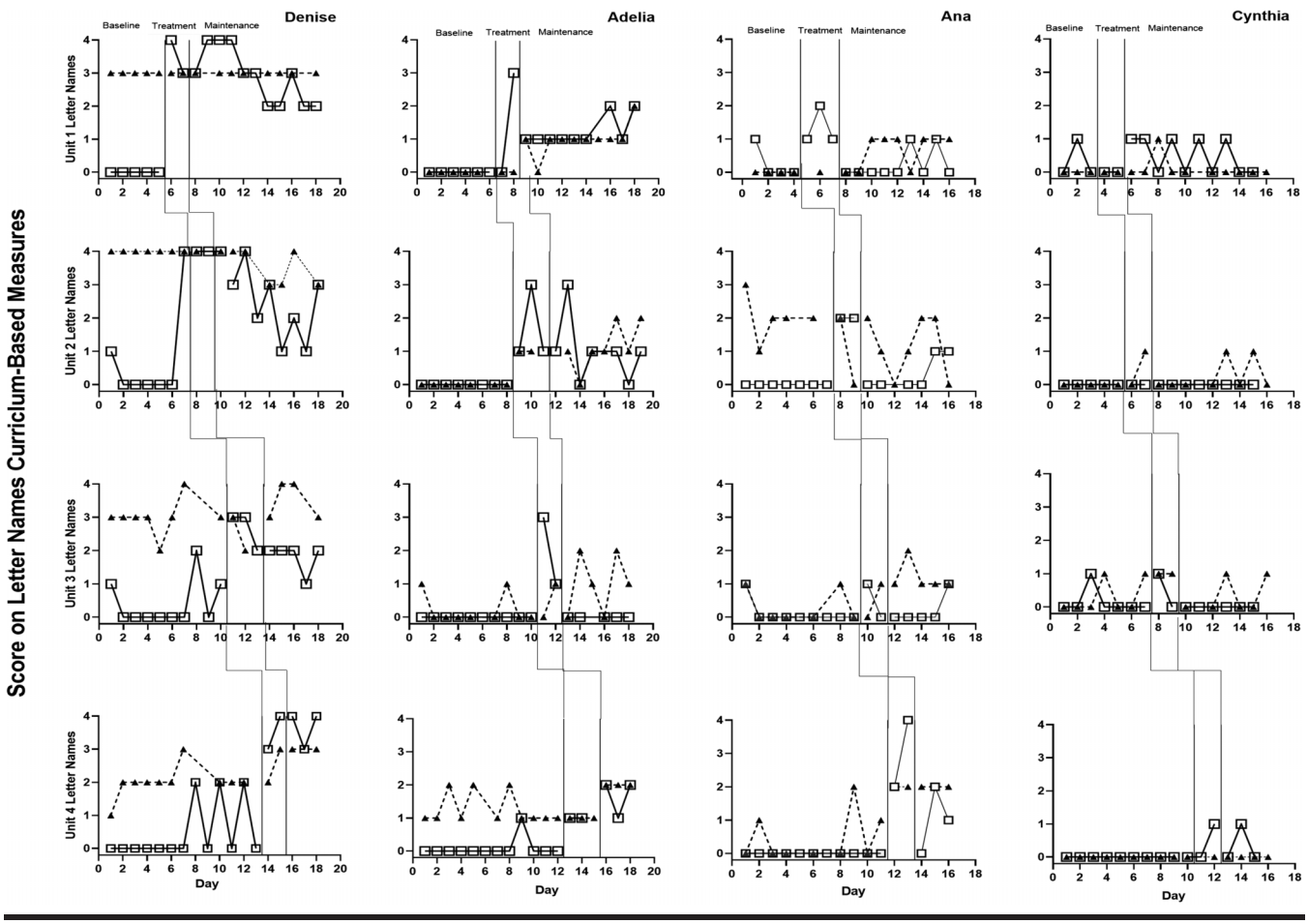

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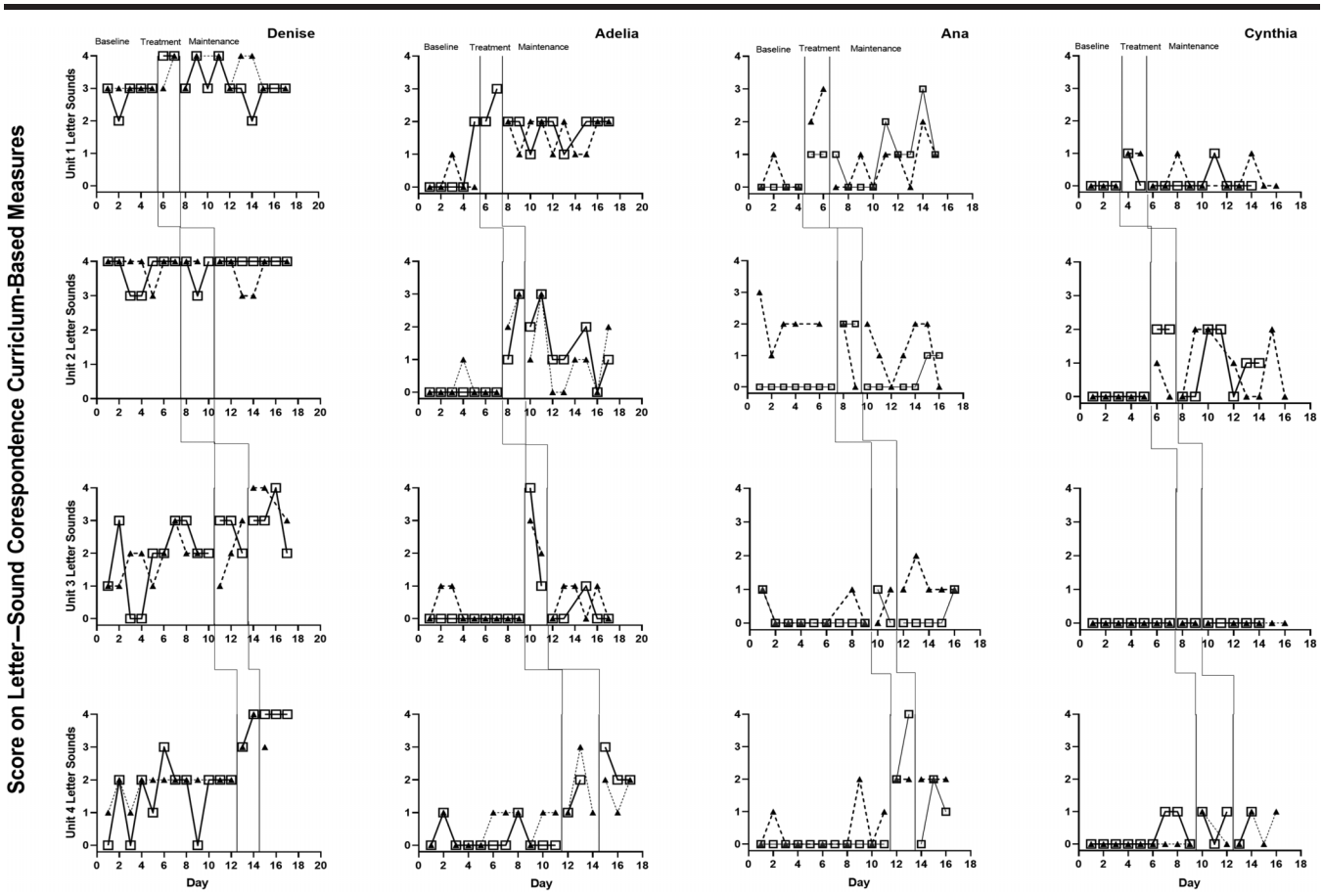
Figure 3. Participants' Spanish (white squares) and English (black triangles) letter sounds scores on the alphabet knowledge curriculum-based measure across units of instruction as measured across sessions.



intervention. Cynthia had an overall low and steady baseline in Spanish and English prior to the intervention.

Spanish Letter-Naming Skills

Graphic displays of participants' scores on Spanish letter names across units of instruction (see Figure 2) indicated that, overall, instructive feedback was effective for some children, but not others. Denise and Adelia demonstrated the greatest gains in their Spanish letter-naming skills after the intervention, with little overlap between their baseline and treatment phases. Denise showed the most complete learning of letter names and the best maintenance. Ana made immediate gains in her Spanish letter-naming skills, but her gains were small and did not maintain. Cynthia made quite modest gains in her Spanish letter-naming skills following the intervention.

Cross-Language Transfer of Letter-Naming Skills

In regard to the extent to which participants' letter-naming skills in Spanish generalized to English, the graphic displays indicated that transfer to English following intervention in Spanish was minimal. Although Denise made gains in her Spanish letter-naming skills, she did not demonstrate transfer to English because her English letter-naming skills were already high at baseline. Adelia and Ana demonstrated overlap between their English letter-naming skills at baseline and treatment for all units of instruction, indicating they did not make gains in English following instruction. Cynthia and Ana only showed minimal transfer of letter-naming skills from Spanish to English for Unit 2. Overall, the results of the visual analyses demonstrated that there was minimal transfer of letter-naming skills across languages, with observed generalization in only two of the 16 (12.5%) possible opportunities for replication.

Spanish Letter–Sound Correspondence

Figure 3 illustrates children's performance in their Spanish and English letter–sound correspondence. Overall, children made small to moderate gains in their Spanish letter–sound correspondence skills. Because Denise had high baselines in her English letter–sound correspondence prior to the intervention, an experimental effect was only evident in the final unit. Adelia demonstrated gains in her Spanish letter–sound correspondence immediately after introducing the letter sounds of Units 2 through 4. Maintenance of these gains was evident, except for Unit 3. Although

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Ana also showed gains in treatment, these gains were more modest than Adelia, and maintenance was compromised, especially in Units 2 and 3. Cynthia showed the least impressive learning; she demonstrated letter–sound correspondence inconsistently for one additional letter in Unit 1 and two letters in Unit 2. No improvements were evident for Units 3 and 4. The modest effects on letter–sound correspondence in Spanish limited the opportunity to examine generalization from Spanish to English. Overall, generalization of letter–sound correspondence from Spanish to English was observed for nine of the 16 (56%) possible replications.

In summary, analyses of the graphic displays indicated that, overall, instructive feedback had modest effects on letter naming and letter–sound correspondence. Children did not readily generalize their letter-naming skills from Spanish to English. There was moderate generalization of letter–sound correspondence skills across languages.

Effect Size Estimates of AK

The effect size estimates supported the results of the visual analyses (see Table 3). The average Tau-U score for the Spanish letter naming was an average of .52, and for Spanish letter–sound correspondence, it was an average of .58, indicating that treatment effects were questionable. Similarly, the average effect size for English letter naming was .19, and for letter–sound correspondence, it was .53, indicating children's average English AK gains were also questionable. The average effect size estimates varied across participants (range: .09–.90). These effects support the findings from the visual analyses, indicating that children made small gains in their AK skills.

Generalization Outcomes of AK Skills

The Spanish and English Letter Naming and Letter Sounds Identification subtests from the IGDIs served as the generalization measures of AK (see Table 4). Only Ana went from below the benchmark to meeting the benchmark on the Spanish Letter Naming IGDI following the intervention, gaining 9 points. Denise performed at benchmark before and after the intervention. Adelia performed at benchmark before intervention but performed below the benchmark after the intervention. Cynthia remained below the benchmark after the intervention.

Two of the children (Ana and Adelia) made gains on the Spanish Sound Identification subtest of the IGDIs that placed them above the benchmark after the intervention. Denise was already on the benchmark prior to the intervention, and Cynthia remained below the benchmark after the intervention.

The children made minimal or no gains on the English Letter Naming subtest of the IGDIs. Children's pre- and posttest scores on the English Sound Identification measure were mixed. Denise made the largest gain (14 points), and Ana's posttest score increased by 5 points. Cynthia's and Adelia's scores were lower at posttest than pretest.

Social Validity

The social validity surveys revealed that the children, parents, and teachers had positive perceptions of *PAsos Para Leer*. All the children reported they liked doing the lessons.

The results of the teacher social validity questionnaire were also positive. Both teachers reported the children made progress in their Spanish and English emergent literacy skills. They stated *PAsos Para Leer* kept children engaged and that providing instruction in Spanish helped children perform better in English. They noted that it was important to promote children's bilingual development and that teaching PA and AK in preschool is important.

Discussion

PA

Consistent with our hypothesis, DLL preschoolers in this study made robust gains in their Spanish and English PA skills after the intervention, indicating that *PAsos Para*

Table 4. Summary of pre– and post–phonological awareness and alphabet knowledge generalization measures scores in Spanish and English.

	Phonological awareness						Alphabet knowledge							
	Spanish		English				Spanish				English			
Child	Pre–*Primeros Sonidos*	Post–Primeros Sonidos	Pre-ISF	Post-ISF	Pre-PSF	Post-PSF	Pre-IGDI LN	Post-IGDI LN	Pre-IGDI Sound ID	Post-IGDI Sound ID	Pre-IGDI LN	Post-IGDI LN	Pre-IGDI Sound ID	Post-IGDI Sound ID
Cynthia	6	7	0	0	0	14	0	6*	6	6	0	0	6	4
Ana	3	9*	1	9	0	18	3	11*	5	10*	2	3	6	11*
Denise	3	14*	5	14*	0	31*	8*	7*	5	10*	7	9	5	19*
Adelia	6	11*	1	9	0	21*	11*	14*	10*	15*	2	2	5	4

Note. ISF = Initial Sound Fluency; PSF = Phoneme Segmentation Fluency; IGDIs = Individual Growth and Development Indicators; LN = Letter Naming; ID = Identification.

*Met benchmarks. Benchmarks: *Primeros Sonidos*: ≥ 8; ISF: ≥ 10; PSF: ≥ 20; IGDIs-Spanish LN: ≥ 6; IGDIs-Spanish Sound ID: ≥ 10; IGDIs-English Sound ID: ≥ 10; IGDIs-English LN: benchmarks not available.

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Leer was efficacious in teaching this important emergent literacy skill. Because these children received PA instruction in Spanish through this intervention and had not received classroom instruction in PA in Spanish and because the potential effects of the classroom instruction were experimentally controlled by measuring children's baseline performance at various time points prior to the intervention, there is evidence that children's Spanish PA gains were due to this intervention. Moreover, improvements were shown when and only intervention was initiated for each PA skill. Gains were made in both the CBMs and in the generalization measures, with only Cynthia failing to meet the benchmark on the *Primeros Sonidos* subtest of the IGDIs. These findings corroborate the results from studies evaluating the effects of *PAth to Literacy*, the English version on which this Spanish PA intervention in this study was based (Olszewski et al., 2017). These findings support that both monolingual and bilingual children benefit from supplemental emergent literacy instruction that is explicit and systematic and offers multiple response opportunities. These findings have important implications, as commercially available preschool curricula do not always include PA instruction that is focused and explicit.

Cross-Language Transfer of PA Skills

Another aim of this study was to address one of the most pressing questions in the fields of early childhood and bilingualism: the extent of cross-language transfer or generalization of skills across languages. Results of this study revealed that all the children who made gains in their Spanish PA skills also exhibited gains in their English PA skills. These findings are in line with the Revised Interdependence Linguistic Hypothesis (Verhoeven, 2007), which postulates that bilingual children with strong PA skills in one language apply these skills to their second language. However, it is important to note that this cross-language transfer of PA skills is nuanced, meaning that the extent of cross-language transfer of PA skills is mediated by the similarities in PA tasks across languages as well as by language-specific characteristics. For example, once children learned to blend words at the syllable level in Spanish (e.g., *ca-sa*), they completed this task successfully in English (e.g., bo-ttle). However, when they were asked to blend onset-rimes in English (e.g., c-at), they had more difficulty applying their Spanish blending skills, as such onset–rimes are rare in Spanish.

Despite these differences in performance, even when tasks differed across the two languages, children's performance in one language predicted their performance in their other language. The findings from this study were consistent with the results reported by Wawire and Kim (2018), in which they found similar patterns of cross-language transfer between Kiswahili, a syllabic language like Spanish, and English. The findings from this study support previous research positing that PA is a metalinguistic skill in which knowledge of PA is highly interrelated across languages; however, there are language-specific word manipulations that do not transfer as readily.

Another important finding in this study that contributes to our existing understanding of cross-language transfer and bilingual instruction is highlighted through the way initial sound identification was taught in Unit 4 of *PAsos Para Leer*. Because initial sound identification is more salient in English than in Spanish, children practiced this PA skill with English words while they received instruction in Spanish. Interestingly, children's performance on the *Primeros Sonidos* measure of the IGDIs-S revealed children applied their initial sound identification skills from English to Spanish. These findings have important implications. First, these findings support that cross-language transfer is bidirectional, meaning that children can apply the skills they learn in their second language to their first. This finding contradicts previous research implying that cross-language transfer is a unidirectional process in which only a child's first language influences their second language, but their second language does not influence their first.

Furthermore, the findings from this study provide preliminary support in favor of providing dual language emergent literacy instruction to children who are DLLs in ways that support their home language. Anthony et al. (2011) and López and Greenfield (2004) suggest that preschoolers who are DLLs with limited English skills benefit from practicing PA skills with English words as long as the bulk of the instruction is in Spanish. Despite this recommendation, no study to date has empirically evaluated the effects of providing children the opportunity to practice English PA skills while teaching the PA tasks using Spanish instruction. Findings from this study provide preliminary evidence in favor of this novel approach to bilingual instruction.

AK

The other aim of this study was to determine if children made gains in their Spanish letter naming and letter–sound correspondence following the intervention when AK skills were taught using instructive feedback. Overall, the gains children made in letter naming and letter–sound correspondence were small to moderate, with most children struggling to maintain gains over time. Although Denise and Adelia made robust gains in their Spanish AK skills after receiving instruction via instructive feedback, Cynthia and Ana struggled to increase and maintain gains in their Spanish AK skills. These findings were in line with a similar study by Olszewski (2015), in which he concluded that instructive feedback that incorporated a progressive time delay resulted in AK gains for all children; however, not all children made equal gains. In his study, only one child learned all of his letter names and sounds following the intervention. His findings, in addition to those from this study, indicate that, although providing AK instruction via instructive feedback is beneficial, not all children will make significant gains following this method of instruction. Thus, we surmise that more explicit forms of AK instruction are needed for many children.

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Cross-Language Transfer of AK Skills

The findings from this study revealed that children did not generalize letter-naming skills from Spanish to English and that they moderately generalized their Spanish letter–sound correspondence to English. These results are also consistent with previous studies by Vaughn, Linan-Thompson, et al. (2006) and Warwire and Kim (2018). One potential explanation for these findings is that, because the letters taught in *PAsos Para Leer* occurred in Spanish and English, many shared the same sounds between the two languages (e.g., /s, p, b, t, f, k, r/). However, because letter names differ between Spanish and English, children did not apply their knowledge of letter names in Spanish to English as easily. For example, in Spanish, the letter N's name sounds like /ɛnɛ/, and in English, it sounds like /ɛn/. These differences between letter names make it difficult for children to label the Spanish letters they know in English.

Warwire and Kim (2018) attribute this difference in transfer of letter sounds versus letter-naming skills to the similarity/discrepancy account. According to this hypothesis, letter sounds and names that are similar across the two languages will transfer, but letter sounds and names that differ significantly across the two languages will not transfer. These authors conclude that, although not all letter names and letter sounds will transfer from one language to another, children receiving AK training in one language are likely to increase their AK in their other language.

Interestingly, some children demonstrated increase gains in English letter naming at maintenance and achieved comparable maintenance of letter sounds in Spanish and English letter sounds. One potential reason for this finding is that the children in this study were attending English immersion classrooms, where they were receiving AK instruction in English. Most preschool AK instruction focuses on letter names rather than letter sounds (Gerde, 2019). It is possible that children had difficulty maintaining their gains in Spanish letter naming because they were not receiving instruction of this skills in the classroom, whereas they continued to be exposed to this skill in English during the maintenance period. Future studies should evaluate the long-term effects of bilingual early literacy instruction in young children's reading development and determine effective ways of promoting biliteracy in children who might be receiving English-only instruction.

Children's AK Performance and Their Individual Variability

The effects of instructive feedback on children's Spanish and English AK skills were variable. These differences in performance are likely associated with individual differences. Per teacher and parent report, Ana and Cynthia, the two children with less gains in their AK skills, had characteristics that could have contributed to their lower performance. Ana's teacher and mother reported she was struggling to retain new information and demonstrated inconsistencies in her performance from day to day. Cynthia required frequent redirection to remain focused, and she had limited knowledge of letters prior to the intervention. For example, when she saw a letter, she would label it as "the number 7." Future studies should focus on identifying the children who are not benefiting from instructive feedback and investigating effects of more explicit approaches to teaching AK.

Alternatively, it is possible that variability in children's AK performance was associated with differences in children's home language proficiency and exposure to literacy activities at home. Future studies should focus on increasing the sample size and gathering data about children's Spanish home literacy experiences.

Limitations

Despite this study's strengths, there are ways in which this study could be improved. First, this study is limited by the scarcity of valid assessments available to evaluate preschoolers' Spanish emergent literacy skills. Including more exhaustive assessments of Spanish PA skills would have strengthened this study; however, limitations in what is currently available made it difficult to evaluate children's Spanish PA outcomes using standardized, generalization measures. There continues to be a dire need for valid assessments of Spanish PA.

Second, this intervention focused on four skills predictive of future reading: blending, segmenting, first-part identification, and initial sound identification. Although the decision to select these treatment targets originated from our existing theoretical understanding of PA development and cross-linguistic analyses of English and Spanish, there continues to be a need for studies to investigate how bilingual children develop PA skills across languages.

Third, it is important to note that this study was the first to develop and evaluate the effects of *PAsos Para Leer* using a single-subject experimental design. Although this design is a scientifically rigorous method for determining efficacy, generalizability of results are limited to similar individuals. Randomized group design studies are needed to determine the generalizability when scaling up *PAsos Para Leer* to samples representing populations of children who are DLLs.

Future Directions

The findings from this study were especially promising for PA skills, suggesting that at-risk Latinx preschoolers benefit from explicit and systematic PA instruction in Spanish to promote their biliterate development. The results of this study, however, are only the first step toward developing effective emergent literacy interventions for at-risk Latinx preschoolers. The findings from this study will guide future refinements and adaptations to the intervention. Future iterations of this intervention will focus on modifying AK instruction to optimize children's gains and adding additional instructional units to advance children's English PA skills (e.g., phoneme segmentation).

Future research should focus on (a) determining the effects of *PAsos Para Leer* when this intervention is scaled-up and delivered by bilingual teachers, (b) comparing the

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effects of *PAsos Para Leer* when the intervention is delivered in English immersion versus bilingual classrooms, (c) developing more valid curriculum-based assessments that evaluate children's Spanish PA skills, and (d) identifying the long-term effects of providing preschoolers with emergent literacy instruction in their home language. Because children with language delays who have limited oral language skills are more likely to have reduced emergent literacy skills (Cabell et al., 2011), it is also important to extend this study to include the effects of *PAsos Para Leer* for Spanish–English bilingual preschoolers with language delays.

Clinical Implications

The findings from this study highlight the importance of providing bilingual children with instruction in their home language, as children benefit from bilingual instruction without detracting their acquisition of English skills (e.g., Durán et al. 2016). Second, it is important to facilitate children's cross-language transfer whenever possible and feasible. Cross-language transfer can be beneficial for all children who are bilingual as it allows them to use to their knowledge in two languages to acquire and master important skills (Garcia, 2020). Third, it is within speech-language pathologists' scope of practice to support preschoolers' emergent literacy skills. Speech-language pathologists' knowledge of language and phonology is highly valuable in promoting the early literacy skills and future academic success of young preschoolers at risk for reading difficulty.

Author Contribution

Andres Crucet-Choi: Data curation (Supporting), Investigation (Supporting). **Howard Goldstein:** Conceptualization (Supporting), Data curation (Supporting), Funding acquition (Lead), Investigation (Supporting), Methodology (Supporting), Supervison (Lead), Writing–Original Draft (Supporting), Writing–Review & Editing (Lead).

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